

Application Number: 10/821,769
Amendment Dated: November 23, 2005

REMARKS

This amendment is responsive to the Office Action dated July 27, 2005 for which a three (3) month period of response was given. In light of the Advisory Action that was mailed on November 4, 2005, Applicants are submitting this Supplemental Response. Please enter this Supplemental Response in lieu of the Response submitted on October 27, 2005. No changes have been made to the claim amendments presented in the October 27, 2005 response.

A Petition and fee for a one (1) month extension of time are enclosed herewith. Also enclosed is a Request for Continued Examination. The Examiner is hereby requested to consider the additional Remarks below that address the issues raised in the Advisory Action mailed November 4, 2005.

Claims 1, 2, 4, 5 and 7 through 20 are pending in the present application upon entry of the above amended claims. Claims 3, 6 and 21 through 30 have been, or were previously, cancelled. Claims 1, 7 and 12 have been amended to more clearly state the nature of the present invention. Support for the amendments to claims 1, 7 and 12 exists in the specification and Figures as originally filed.

Additionally, claims 4, 8 through 11 and 13 through 20 have been amended for clarification purposes. No new matter has been added via the amendments to claims 4, 8 through 11 and 13 through 20. Accordingly, entry and consideration of all of the amendments to the claims and the remarks which follow is believed warranted and is respectfully requested.

The 35 U.S.C. § 112, Second Paragraph Rejections:

Claims 1, 2, 4, 5 and 7 through 11 have been rejected under 35 U.S.C. § 112, second paragraph. Specifically, the Examiner contends that Claims 1, 2, 4, 5 and 7 through 11 are indefinite due to the phrase "and having a cross section having a substantially constant diameter" as recited in claim 1. Furthermore, the Examiner points out that the "the rectangular cross section", as recited in claim 7, has no antecedent basis.

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In response to the above rejection, claims 1 and 7 have been amended. Specifically, claim 1 now recites that a fiber-reinforced composite spring comprises a spring wire, where the spring wire comprises (i) a core that includes a plurality of fiber tows; and (ii) an outer layer of resin that is substantially devoid of the fiber tows, wherein the resin outer layer has a constant thickness and cross-sectional shape, and is generally uniform and free of any surface irregularities, thereby yielding a spring that has a predictable rate of deformation when subjected to a compressive load (emphasis added). Claim 7 has been amended to eliminate the above-mentioned antecedent basis issue.

Given amended claims 1 and 7, it is believed that the 35 U.S.C. § 112, second paragraph, rejections to claims 1, 2, 4, 5 and 7 through 11 have been rendered moot. Accordingly, withdrawal of these rejections is believed to be warranted and is respectfully requested.

The New Matter Rejection Raised in The Advisory Action:

In light of the Examiner's rejection, as new matter, of the amendment to claims 1 and 12 that specifies that the outer layer has a constant thickness, Applicants respond as follows. The amendment made to claims 1 and 12 specifies that the outer layer of resin (or out resin layer) has, overall, a constant thickness and cross-sectional shape. Such an amendment is supported by the disclosure contained in the specification as filed (see, e.g., Figures 2 and 7).

The above interpretation of the amendment to claims 1 and 12 would be clear to one of ordinary skill in the art because the adjective "constant" modifies both the terms "thickness" and "cross-sectional shape". Accordingly, the new matter rejection raised in the Advisory Action is unfounded, and withdrawal thereof is respectfully requested.

In light of the above, the amendments to the claims, as detailed herein, are believed to be supported by the specification as filed, and entry thereof is respectfully requested.

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The 35 U.S.C. § 102 Rejections:

Claims 1, 2, 4, 5, 9 through 20 and 27 through 30 have been rejected under 35 U.S.C. § 102(b) over Fish (U.S. Patent No. 6,454,251); claims 1, 2, 4, 5, 8 through 20 and 27 through 30 have been rejected under 35 U.S.C. § 102(b) over Reinhart et al. (U.S. Patent No. 2,852,424); claims 1, 2, 4, 5, 9 through 20 and 27 through 30 have been rejected under 35 U.S.C. § 102(b) over Hashimoto (U.S. Patent No. 4,473,217); and claims 1, 2, 4, 5, 10 through 20 and 27 through 30 have been rejected under 35 U.S.C. § 102(b) over Taylor (U.S. Patent No. 4,991,827).

With regard to the 35 U.S.C. § 102(b) rejections of claims 27 through 30, these rejections have been rendered moot in view of the cancellation of claims 27 through 30.

As noted above, independent claims 1 and 12 have been amended. Amended claims 1 and 12 are now directed to fiber-reinforced composite springs that include a spring wire, the spring wire comprising a core that includes a plurality of fiber tows, and an outer layer of resin that is substantially devoid of the fiber tows, wherein the resin outer layer has a constant thickness and cross-sectional shape, and is generally uniform and free of any surface irregularities, thereby yielding a spring that has a predictable rate of deformation when subjected to a compressive load (emphasis added).

Turning to the art of record, Fish, U.S. Patent No. 6,454,251, is directed to a composite core assembly used to fabricate high performance structures, such as springs. In one form, the core assembly is composed of an inner composition of structurally fibrous material and an external cladding. Resin is impregnated into the fibrous material; and the external cladding functions as a containment device for liquid resin material during the fabrication of structural parts. As can be seen From Figure 2C, the core assembly of Fish does not contain, nor does it teach or suggest, a resin outer layer that is: (i) substantially devoid of the fiber tows; (ii) has a constant thickness and cross-sectional shape, and (iii) is generally uniform and free of any surface irregularities. Accordingly, Fish fails to disclose, teach or suggest the springs of pending claims 1 and 12.

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Reinhart et al., U.S. Patent No. 2,852,424, is directed to reinforced plastic springs made by subjecting a circular-shaped tube 12, containing a homogenous mixture of glass rovings 14 and liquid resin 10, to twisting about a mandrel. After curing of the resin/glass roving mixture, tube 12 is removed. As can be seen from Figure 3 of Reinhart et al., tube 12 contains a homogeneous mixture of glass rovings 14 and liquid resin 10. The homogeneous nature of the spring of Reinhart et al. is confirmed by the passage at column 3, lines 64 to 68. Given the disclosure contained therein, Reinhart et al. fails to disclose, teach or suggest a spring comprising, in part, a core that includes a resin outer layer that is: (i) substantially devoid of the fiber tows; (ii) has a constant thickness and cross-sectional shape, and (iii) is generally uniform and free of any surface irregularities. As such, Reinhart et al. fails to disclose, teach or suggest a spring that includes a core as specified in pending claims 1 and 12.

Hashimoto, U.S. Patent No. 4,473,217, is directed toward a fiber-reinforced resin coil spring and method of manufacturing such a spring. The Hashimoto spring is formed by a spring wire comprising a plurality of bundled glass fibers that are impregnated with a thermosetting resin. Once impregnated, the bundled glass fibers are subjected to a tensile force and twisted about a longitudinal axis to form a resin-immersed and twisted rod-shaped fiber bundle. As is specified at column 2, lines 61 to 65, Hashimoto notes that the resin impregnated within the fiber bundle is slightly squeezed out by the twisting step, and as a result, the content of the fiber in the rod-shaped fiber bundle is increased.

Given the disclosure contained therein, Hashimoto fails to disclose, teach or suggest a spring comprising, in part, a core that includes a resin outer layer that is: (i) substantially devoid of the fiber tows; (ii) has a constant thickness and cross-sectional shape, and (iii) is generally uniform and free of any surface irregularities. As such, Hashimoto fails to disclose, teach or suggest a spring that includes a core as specified in pending claims 1 and 12.

Taylor, U.S. Patent No. 4,991,827, discloses a spring formed from a rope that has been pressure-saturated with a binder. The rope comprises a plurality of twisted strands, each containing a plurality of monofilaments. The strands are combined with a binder such that the rope is saturated with the binder under pressure to cause the binder to enter all of

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the spaces between the monofilaments and form an irregular outer layer on the outer periphery of the rope (emphasis added – see column 3, lines 52 to 63 and Figure 3). After the rope has been saturated, it is permitted to drain to remove the excess binder. Thereafter the drained rope and binder combination is pulled through a tubular sheath, causing the rope to retain its saturated condition and shape. Thereafter, the rope binder combination is wound about a suitable mandrel and cured to yield a spring.

In view of the above, Taylor fails to disclose, teach or suggest a spring comprising, in part, a core that includes a resin outer layer that is: (i) substantially devoid of the fiber tows; (ii) has a constant thickness and cross-sectional shape, and (iii) is generally uniform and free of any surface irregularities. As such, Taylor fails to disclose, teach or suggest a spring that includes a core as specified in pending claims 1 and 12.

Furthermore, it is important to note that a fiber-reinforced composite spring containing a core as recited in pending claims 1 and 12 possesses advantages over the springs disclosed in the prior art of record. For example, when springs in accordance with the present invention are placed under stress, the applied load on such springs is generally constant along a longitudinal axis of the spring wire. That is, springs in accordance with the present invention generally have no weak points or defects within their cores.

Accordingly, since none of Fish, Reinhart et al., Hashimoto, and/or Taylor disclose a spring that contains a core as recited in pending claims 1 and 12, the cited art cannot anticipate any combination of claims 1, 2, 4, 5 and 8 through 20, and withdrawal of the pending anticipation rejections is respectfully requested.

The 35 U.S.C. § 103 Rejections:

Claim 7 has been rejected under 35 U.S.C. § 103(a) over Fish (U.S. Patent No. 6,454,251) in view of Petrina (U.S. Patent No. 6,612,556); Taylor (U.S. Patent No. 4,991,827) in view of Petrina (U.S. Patent No. 6,612,556); Hashimoto (U.S. Patent No. 4,473,217) in view of Petrina (U.S. Patent No. 6,612,556); and Reinhart et al. (U.S. Patent No. 2,852,424) in view of Petrina (U.S. Patent No. 6,612,556).

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Petrina discloses a single spring unit which includes a multi-helical spring formed of composite materials. While Petrina teaches that the wire can be rectangular in cross section, this does not disclose, teach or suggest a spring containing, in part, a core as specified in pending claim 1. That is, Petrina fails to disclose, teach or suggest a spring comprising, in part, a core that includes a resin outer layer that is: (i) substantially devoid of the fiber tows; (ii) has a constant thickness and cross-sectional shape, and (iii) is generally uniform and free of any surface irregularities. For at least this reason, Petrina fails to cure the deficiencies of Fish; Taylor, Hashimoto, and Reinhart et al.

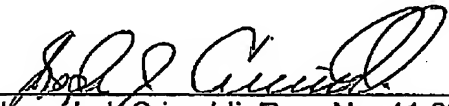
In view of the above, the obviousness rejections of claim 7 appear to be unfounded and withdrawal thereof is respectfully requested.

Conclusion:

For at least the foregoing reasons, the rejections under 35 U.S.C. §§ 102(b), 103(a), and 112, second paragraph, are believed to be unfounded. Accordingly, withdrawal of the pending rejections and allowance of the pending claims is respectfully requested.

Should the Examiner wish to discuss any of the foregoing in more detail, the undersigned attorney would welcome a telephone call.

Respectfully submitted,



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